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MINISTRY OF RAILWAYS

(Railway Board)

RESOLUTION

New Delhi, the 11th May, 1957

No. 6062-TT.—In their Notification No. E(AO)58API-8 dated 10th December 1956 published in Part II, Section 3 of the Government of India Gazette dated 10th December, 1956, Government announced the setting up of a Commission of Enquiry consisting of Shri Sundarlal Trikulmal Desai, a Judge of the High Court of Bombay, to consider the Report of the Government Inspector of Railways on the accident to No. 585 Down passenger train on 2nd September, 1956, between Jadcherla and Mahbubnagar stations on the Central Railway, and to state its findings as to the causes of the accident and the person or persons responsible therefor. The Commission has submitted its report which has been examined and which, together with the reports of the Assessors and of the Government Inspector of Railways is being published for general information.

2. Government observe that the technical assessment and the conclusions reached by the Commission differ from those of the Government Inspector. The two Assessors of the Commission have also expressed divergent views. Such lack of agreement on issues which are essentially of a technical nature, has necessitated a reappraisal of the facts of the case by Government.

3. The points that emerge from the Commission's report are:—

- (i) The accident was occasioned by the breaching of the approach embankments of bridge No. 229 due to a sudden and heavy downpour in the catchment area of the bridge.
- (ii) The bridge was built by the late Nizam's State Railway in 1916 with a single span of 20 ft. The ventway had been provided on the basis of the Dicken's formula which had been in vogue for determination of bridge openings in this area.
- (iii) The ventway of the bridge has proved to be adequate for all floods for 40 years since its construction in 1916 and there is no record of damage to it during this period till August 1956.
- (iv) On 1st August 1956, that is, a month before the accident, the bund of the Pochani tank which lies in the catchment area, had burst and the entire quantity of the impounded water of about 13 million cft. was suddenly released through the bridge, which could not freely allow this heavy flow; in consequence the railway track was overtopped by about 3 ft. of water and the approaches to the bridge on either side were washed away. On this occasion timely action by the Bridge Watchman to stop a goods train, which was on its way, averted an accident. Prior to 1953, the Pochani tank had been in disuse and disrepair for years and it was restored in that year.

(v) The repairs to the approaches after the breach on 1st of August, 1956 had been efficiently executed, and the normal speed had been restored after the bank had fully consolidated. The bridge was structurally sound.

(vi) On the length of 11 miles between Mahbubnagar and Jadcherla, there were 4 patrolmen and 5 watchmen posted on duty on the night of the accident. The object of posting watchmen in addition to patrolmen was to exercise a special watch on bridges which were considered vulnerable owing to the potential danger of the bursting of the banks of the irrigation tanks which existed in their catchments. It was permissible under the Chief Engineer's orders to group the surveillance of bridges situated within a distance of one mile, under one watchman. Bridges No. 229 and 223 which are a thousand yards apart were placed under one watchman. They were scheduled to be covered four times during the night by the patrolmen. In addition, the bridge watchman could have covered the distance between the two bridges under his charge a number of times.

4. In regard to the question of responsibility for the accident, while the Government Inspector of Railways has held that nobody is to blame, the Commission has come to the conclusion that the Railway Administration and its officials are responsible for the failure to provide a bridge opening adequate for discharging the flood resulting from a rainfall of 2 to $2\frac{1}{2}$ inches per hour.

5. This figure is based upon the Commission's estimate of rainfall in the catchment area on the fateful night being 2" to $2\frac{1}{2}$ " an hour. It is at best a guess in the absence of a continuous self-recording rain gauge in the area which alone could give a reliable estimate of the intensity of rainfall. The Government Inspector of Railways has assessed the intensity of rainfall as 4" per hour.

6. The points for consideration are whether the bridge was designed initially by the ex-Nizam's State Railway on correct engineering principles and whether there was any negligence in not redesigning the bridge later to provide a bigger ventway. The opinion expressed by one of the technical assessors, Shri N. K. Mitra, is:—

"The bridge was designed on the basis of Dicken's Formula which was extensively used in these parts of the country and its capacity on the basis of 4.78 sq. miles of catchment area taking 800 as co-efficient is 2587 cusecs. Almost the same view has been taken by the State Irrigation Department for the design of the overflow of the weir of the Pochani-Kunta tank when restored in 1953."

"There are at least a dozen engineers' formulae on discharge from catchment basins, such as Dickens, Ryves, Beale, Craig, Chamier, Rhind, Talbot, Inglis & Ali Newaj, Khosla, Hearn, Killie and others, all based on experience and on a number of assumptions. If the assumptions made in each case do not fully meet the conditions of any particular basin, the results may be quite inaccurate. Even if a catchment is properly surveyed and measured, the run off will depend on physical conditions, vegetation, nature of soil and many other factors and above all some assumptions will have to be made for the nature, extent and intensity of rainfall. Upto now, for Southern India, nobody has found serious fault with Dicken's formula being applied with co-efficient dependent on the average rainfall of the year and yet we know that in this particular instance the discharge was considerably higher than could be obtained from this formula and he would be bold engineer indeed who would be able to guarantee 100% security against all floods and their effect on Railway banks and waterways and yet design his works on rational and economical basis. His today's assumption of 3" intensity of rainfall may be falsified by a 4" fall next year. Similarly for other formulae."

The bridge had been constructed and the ventway provided according to the well recognised practice in the area. The propriety of this practice of designing a ventway according to Dicken's Formula, of one inch rainfall per hour, is confirmed by the evidence of the experts working in the area, including the opinion of Shri Thirumale Iyengar, Chief Engineer, Hirakud Dam Project, in his reply to the Commission's questionnaire. It is unfortunate that this expert

opinion, based upon 30 years' experience in that part of the country, was not taken into consideration by the Commission, although received before the report was written, on the ground that it was received after the sittings had been concluded.

7. The next point for consideration is whether the experience of the Jangaon accident in 1954 indicated the necessity for any modification to the ventway of this bridge. In view of the fact that the Central Railway has about 15 000 bridges, the most practical and reasonably effective method for determining whether any of the bridges was vulnerable in the same way as the Jangaon Bridge was to scrutinise carefully the past history of each bridge and then to take corrective action. This was done, and upto the date of the accident twelve bridges had actually been modified as a result of this investigation. Bridge No. 229 had no previous history and there was, therefore, no reason to apprehend any danger. No action was, therefore, taken to increase the ventway.

8. Taking all the facts into consideration, Government are of the view that there was no error in the design of the bridge when it was built in 1916 and that no change was made to the Central Railway Administration or to its senior officers, not having selected this bridge for an increase of waterway subsequent to the Jangaon accident in 1954. In coming to this conclusion, Government have also taken into account that:—

- (a) The road bridge downstream of the railway line, which has been in existence for over a century, has an opening of only 10 ft. Evidence shows that it had never been overtopped prior to 1st August 1956 when the Pochani tank had burst.
- (b) The bursting of the Pochani tank on the 1st of August had simply restored the pre-1953 position when the tank was in a state of disuse and disrepair and the entire catchment discharged directly into the railway bridge and this event, therefore, did not by itself warrant any modification to the bridge opening.
- (c) The evidence of the witnesses residing in the locality and the past history of the rail and road bridges revealed that the intensity of the rainfall in the catchment of the bridge on this occasion was unprecedented.

9. The Commission has further held that it was imprudent to apply the system of grouping bridges Nos. 229 and 223 under one watchman. Government do not entirely agree with this view. The watch over a group of bridges located within a mile of each other was supplementary to the local system of patrols and cannot be considered inadequate in view of the following important facts:—

- (1) There were nine patrolmen and watchmen on duty on the night in question on the 11 mile length of track between Mahbubnagar and Jadcherla stations.
- (2) The two bridges Nos. 229 and 223 were only a thousand yards apart and were scheduled to be inspected by the patrolmen four times during the hours of darkness and, in addition to the patrols, by the bridge watchmen, a number of times.

10. Government consider that the bridge watchmen tarried much longer than was justified or necessary at bridge No. 223 during the critical period on the fateful night when, having become aware of the breaches in the railway embankment on the Mahbubnagar side, he did not, as a measure of common prudence, hasten to bridge No. 229 immediately after protecting the line with detonators on sighting the danger signal exhibited by the patrolmen on the Mahbubnagar side. The watchman was, according to his own evidence, aware of his responsibilities in regard to bridge No. 229 and it is unfortunate that he failed to react in a manner which his longstanding experience in railway working should have impelled him to do.

11. Notwithstanding the view of Government that, in the matter of adequacy of watch, no negligence or lack of forethought can reasonably be attributed to the officers of the Central Railway Administration, they are of opinion that once a decision had been taken to exercise a watch on bridge No. 229 after the repairs had been executed following upon the breaches of August 1, 1956 it would have

been more prudent to have posted an exclusive watch on the bridge, having regard to the purely local circumstances that the approaches of the bridge were in cutting an on a curve. This omission was an error of judgment on the part of the local executive officials.

12. While holding that there has been no negligence in respect of the provision of adequate waterway for this bridge, Government cannot but express profound distress at the loss and injury to life and damage to property arising out of unprecedented floods and are alive to the need for taking all possible measures for the safety of the travelling public as far as railway bridges are concerned, and for the minimising of damage arising from floods everywhere. The stress that the Enquiry Commission has laid on the importance of hydrographic surveys and studies in conjunction with meteorological data is therefore accepted as appropriate by the Government.

13. In their Resolution No. BW 14/7/54, dated 8th September, 1954, the Government have already set up a Central Flood Control Board with the Union Minister for Irrigation and Power as Chairman to devise measures, immediate, short-term and long-term, to minimise flood damage. In addition, Government have organised River Commissions which, in the course of their investigations, are reviewing the openings through Railway and road embankments.

14. Further, in Resolution No. DWV 530 (1)/56, dated the 12th of April, 1957 of the Ministry of Irrigation and Power, Government have appointed another Expert Committee to analyse the factors responsible for a succession of heavy floods and to review the remedial measures therefor.

15. Topographical changes have taken place in the country. There has been deforestation, increase of cultivation; embankments have been built; and rainfall characteristics appear to have altered. It is necessary to review the entire situation as it affects the Railways in the light of this accumulated knowledge. The time is opportune for such a review, having regard to the extensive bridge works provided for in the Second Five Year Plan.

16. The Government of India have accordingly, under Resolution No E57CO1/3(RBI) of 4th March, 1957, appointed a high level committee of Engineers with Dr. A. N. Khosla, ex-Chairman of the Central Water and Power Commission, and an eminent expert in hydraulic engineering, now Vice-Chancellor of the Roorkee University, as its Chairman, for undertaking the necessary investigation, and this Committee is at present engaged in this task.

ORDERED that the Resolution be published in the Gazette of India for general information.

D. C. BAIJAL, Secy.